

भारतीय मानक
प्राकृतिक निर्माण पत्थरों का अपक्षयन
ज्ञात करना — परीक्षण पद्धति
(दूसरा पुनरीक्षण)

Indian Standard
**DETERMINATION OF WEATHERING OF NATURAL
BUILDING STONES — METHOD OF TEST**
(*Second Revision*)

ICS 91.100.15

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Stones Sectional Committee had been approved by the Civil Engineering Division Council.

Building stones are available in large quantity in various parts of the country and to choose and utilize them for their satisfactory performance, it is necessary to know the various properties determined according to standard procedure. This standard has, therefore, been formulated to cover the standard method for determining the weathering of various stones. The method of test prescribed in this standard determines the resistance of stone towards corrosive ground water, wetting and drying, sulphate attack and temperature variations.

This standard was first published in 1957 and first revised in 1974 based on its actual use and the experience gained in testing of building stones for weathering in the various research laboratories in the country.

This second revision has been brought out to incorporate the further experience gained based on the use of the standard since its last revision. The major modifications incorporated in the revision are as follows:

- a) SI units have been used.
- b) Size of the samples has been specified as stones of adequate size in place of the requirement of at least 25 kg specified earlier.
- c) Dimension of specimen has been modified thereby specifying the same to be not less than 50 mm or 10 times the largest size of mineral grain present in the stone, whichever is greater.
- d) The minimum number of test specimen has been revised from 3 to 5 for test for each of the set of conditions. Provision of an additional specimen as reference specimen has been included.
- e) Conditioning requirements of the test specimens have been modified thereby specifying $70 \pm 5^{\circ}\text{C}$ in place of $105 \pm 5^{\circ}\text{C}$ specified earlier.
- f) Requirement of visual examination of the test specimen after carrying out the weathering test has been included.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated expressing the results of a test or analysis, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

DETERMINATION OF WEATHERING OF NATURAL BUILDING STONES — METHOD OF TEST (*Second Revision*)

1 SCOPE

This standard lays down the procedure for testing weathering of natural building stones used for constructional purposes.

2 REFERENCE

The following standard contains provisions which through reference in this text, constitutes provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

<i>IS No.</i>	<i>Title</i>
1121 (Part 2) : 2013	Methods of test for determination of strength properties of natural building stones: Part 2 Transverse strength (<i>second revision</i>)

3 SELECTION OF SAMPLES

3.1 The sample shall be selected to represent a true average of the type or grade of stone under consideration.

3.2 The sample shall be selected from the quarried stone or taken from the natural rock, as described in **3.2.1** and **3.2.2** and shall be of adequate size to permit the preparation of the requisite number of test specimens.

3.2.1 *Stones from Ledges or Quarries*

The ledge or quarry face of the stone shall be inspected to determine any variation in different strata. Differences in colour, texture and structure shall be observed. Separate samples of stone of adequate size of the unweathered specimens shall be obtained from all strata that appear to vary in colour, texture and structure. Pieces that have been damaged by blasting, driving wedges, heating, etc, shall not be included in the sample.

3.2.2 *Field Stone and Boulders*

A detailed inspection of the stone and boulders over the area shall be made where the supply is to be

obtained. The different kinds of stones and their conditions at various quarry sites shall be recorded. Separate samples for each class of stone that would be considered for use in construction as indicated by visual inspection shall be selected.

3.3 When perceptible variations occur in the quality of rock, as many samples as are necessary for determining the range in properties shall be selected.

4 TEST SPECIMENS

4.1 Test specimens shall be made from samples selected in accordance with **3** and shall be in the form of cubes or cylinders. They shall be cut or drilled from the samples. The diameter or lateral dimension (distance between opposite vertical faces) of a test specimen shall not be less than 50 mm or 10 times the size of the largest mineral grain present in the rock, whichever is greater and the ratio of height to diameter or lateral dimension shall not be less than 1:1.

NOTE — Test specimens prepared out of broken beams in the transverse test [see IS 1121 (Part 2)] may also be used.

4.2 The test specimens shall be finished smooth and the edges shall be rounded to a radius of approximately 3 mm by grinding.

4.3 Five test specimens shall be used for conducting the test. One additional specimen shall be retained as a reference specimen.

4.4 The test specimens shall be dried in a well ventilated oven for 24 h at $70 \pm 5^\circ\text{C}$ and cooled in a desiccator to room temperature (20°C to 30°C) to constant mass. Constant mass is considered to have been achieved when two consecutive hourly measurement of mass do not vary by more than 0.1 percent.

5 APPARATUS

The apparatus shall be as illustrated in Fig. 1. It shall consist of an enclosed balance of 1 kg capacity that is sensitive to 0.01 g and suitable accessories for weighing the specimen in water.

6 PROCEDURE

6.1 The dried and cooled test specimens (*see 4.4*) shall be weighed to the nearest 0.01 g and the mass of each

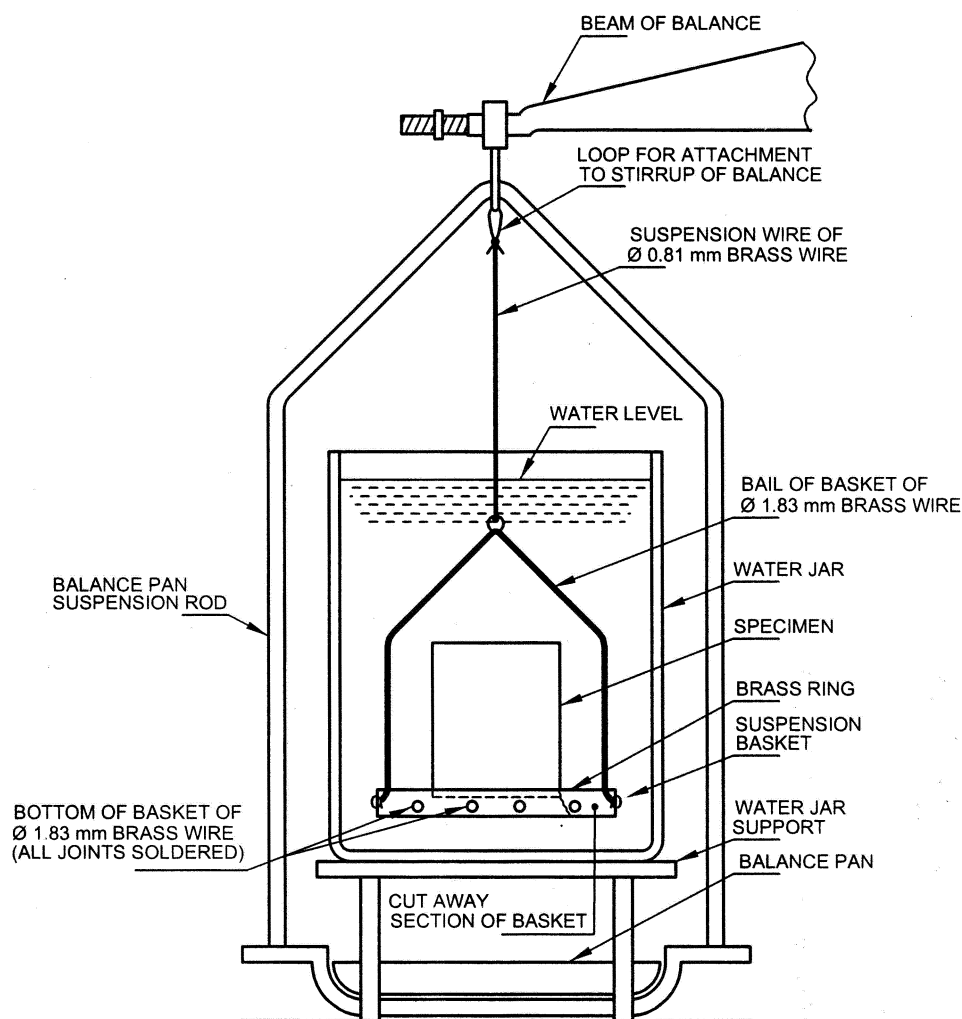


FIG. 1 APPARATUS FOR CONDUCTING WEATHERING TEST

recorded (W_1). The specimens shall then be submerged in water at 20°C to 30°C for 24 h. Each specimen shall be weighed (W_2) whilst totally immersed and freely suspended in water (when weighing test specimens in water, they shall be weighed suspended in such a position that air is not entrapped in the cavities). It shall then be removed, the surface water wiped off with a damp cloth and weighed again (W_3). The weighing of each specimen shall be completed within 3 min of its removal from water.

6.2 Each specimen shall be placed in a flat dish, made of glass, porcelain or glazed stonework, 90 mm in diameter and 15 mm in depth to which shall be added 2 g of powdered gypsum and 25 ml of water. The dishes together with specimens shall then be placed in a well ventilated oven and maintained at a temperature of $105 \pm 2^\circ\text{C}$ for at least 5 h or until the water has evaporated and the powder becomes dry. The dishes shall be removed from the oven and cooled to $25 \pm 5^\circ\text{C}$. This

completes the first cycle. The cycle shall then be repeated 29 times in a same manner, except that only 25 ml of water shall be added for each of the subsequent cycles.

6.3 At the end of the 30 cycles, the specimens shall be cleaned by brushing with a stiff-fibre brush to remove any particles of gypsum clinging to the surface. Each specimen shall be immersed in water for 24 h, surface dried, and weighed first in air (W_4) and then in water (W_5) as described in 6.1.

6.4 The test specimens, after the test, shall be visually examined *vis-à-vis* the reference specimen with regard to any change in colour, crack/fracture, spall, texture and deposition.

7 EVALUATION

The increase/change in absorption and the increase in volume of each test piece after the 30 cycles of the test shall be calculated as follows:

$$A_1 = \frac{W_3 - W_1}{W_1} \times 100 \quad \dots (1)$$

$$V_1 = \frac{W_3 - W_2}{d} \quad \dots (2)$$

$$A_2 = \frac{W_4 - W_1}{W_1} \times 100 \quad \dots (3)$$

$$V_2 = \frac{W_4 - W_5}{d} \quad \dots (4)$$

$$\text{Increase in absorption, percent} = \frac{A_2 - A_1}{A_1} \times 100 \quad \dots (5)$$

$$\text{Increase in volume, percent} = \frac{V_2 - V_1}{V_1} \times 100 \quad \dots (6)$$

where

A_1 = original absorption of the specimen during 24 h immersion in water, expressed as percentage by mass;

W_3 = original mass of surface-dried specimen after 24 h immersion in water (*see 6.1*);

W_1 = original mass of oven-dried specimen (after 24 h immersion) (*see 6.1*);

V_1 = original volume of the specimen after 24 h immersion in water;

W_2 = original mass of specimen freely suspended in water after 24 h immersion (*see 6.1*);

d = density of water at the temperature of observation (*see 6.1*);

A_2 = final absorption of the specimen after 30 cycles of the test expressed as percentage by mass;

W_4 = final mass in air of surface-dried specimen after 30 cycles of the test and 24 h immersion in water (*see 6.3*);

V_2 = final volume of the specimen after 30 cycles of the test; and

W_5 = final mass of the specimen freely suspended in water after 30 cycles of the test and 24 h immersion in water (*see 6.3*).

8 REPORT OF TEST RESULTS

8.1 The average of the five individual determinations shall be reported as the percentage increase in absorption and percentage increase in volume of the sample. The result of visual examination (*see 6.4*) shall also be reported.

8.2 The following additional information shall be reported along with the test results:

- a) Size and shape of the test specimens used in the tests; and
- b) Identification of the sample, including name and location of the quarry; name or position of the natural rock, date when sample was taken and trade-name or grade of stone.

ANNEX A*(Foreword)***COMMITTEE COMPOSITION**

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In personal capacity (<i>C-3/3188, Vasant Kunj, New Delhi</i>)	DR A. K. DHAWAN (Chairman)
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Shriram Institute of Industrial Research, Delhi	DR LAXMI RAWAT SHRI R. K. SINGH (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
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This Indian Standard has been developed from Doc No.: CED 06 (7763).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones : 2323 0131, 2323 3375, 2323 9402

Website: www.bis.org.in

Regional Offices:

Telephones

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

{ 2323 7617
2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi
KOLKATA 700054

{ 2337 8499, 2337 8561
2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 260 3843
260 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113

{ 2254 1216, 2254 1442
2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
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